

# Engine Certification



**April 2008**  
**Kathleen Mead, Manager**  
**Retrofit Implementation Section**

**California Environmental Protection Agency**



**Air Resources Board**

# Today's Presentation

- Engine Certification Process
- After Market Parts Exemption
- Verified Diesel Emission Control Systems (VDECS)
- In Use Fleet Regulations
- Statewide Bus and Truck Regulation

# Engine Certification Overview

- Demonstrate exhaust system durability and emissions with standards
- Executive Order (EO) is issued
  - Engine Family Name
  - Includes pertinent engine and emissions information
- California or 50-state certification required

## **Engine Certification Information:**

[www.arb.ca.gov/msprog/onroad/cert/cert.php](http://www.arb.ca.gov/msprog/onroad/cert/cert.php)



California Environmental Protection Agency

## AIR RESOURCES BOARD

CUMMINS INC.

EXECUTIVE ORDER A-021-0446  
New On-Road Heavy-Duty Engines

Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 and Executive Order G-02-003;

**IT IS ORDERED AND RESOLVED:** The engine and emission control systems produced by the manufacturer are certified as described below for use in on-road motor vehicles with a manufacturer's GVWR over 14,000 pounds. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE <sup>1</sup>	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS <sup>2</sup>	ECS & SPECIAL FEATURES <sup>3</sup>
2007	7CEXH050SCAA	8.3	Diesel	Diesel	MHDD	DDI, TC, CAC, ECM, EGR, PTOX, OC
ENGINE (L)		ENGINE MODELS / CODES (rated power, in hp)				
8.3		ISC 360 / 8788;FR91902 (350)				
*		*				
*		*				
*		*				

<sup>1</sup> =not applicable; GVWR=gross vehicle weight rating; 13 CCR xyz=Title 13, California Code of Regulations, Section xyz; 40 CFR 86.abc=Title 40, Code of Federal Regulations, Section 86.abc;  
<sup>2</sup> =liter; hp=horsepower; kw=kilowatt;  
<sup>3</sup> CNG/LNG=compressed/liquefied natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;  
L/MH HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDO=heavy duty Otto;  
ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; WU (prefix) =warm-up catalyst; DPF=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAPS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SF/MPFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; ID/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR=exhaust gas recirculation; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; 2 (suffix)=in series (2005DEC22)

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.1 (urban bus) or 13 CCR 1956.8 (other than urban bus); 2) the EURO and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, in g/bhp-hr, for this engine family. "Diesel" CO, EURO and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.1 or 13 CCR 1956.8 are in parentheses.)

	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.14	0.14	*	*	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	1.25	1.25	1.2	1.2	*	*	*	*	*	*
CERT	0.02	0.000	1.06	0.84	1.1	0.8	0.1	0.00	0.001	0.000	*	*
NTE	0.21		1.88		1.8		19.4		0.02		*	

\* g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; EURO=Euro III European Steady-State Cycle; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde;

**BE IT FURTHER RESOLVED:** Certification to the FEL(s) listed above, as applicable, is subject to the following terms, limitations and conditions. The FEL(s) is the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

**BE IT FURTHER RESOLVED:** The listed engine models have been certified to the split engine family standards under 13 CCR 1956.8(b) [Diesel engines] or 13 CCR 1956.8(d) [Otto engines] and the incorporated 40CFR 86.007-15(m)(9).

**BE IT FURTHER RESOLVED:** For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels) and 13 CCR 2035 et seq. (emission control warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

The Bureau of Automotive Repair will be notified by copy of this Executive Order.


Executed at El Monte, California on this 2 day of March 2007.



Annette Hebert, Chief  
Mobile Source Operations Division



# Engine and Emission Control Systems from EO

 <b>CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY</b> <b>AIR RESOURCES BOARD</b>	CUMMINS INC.	EXECUTIVE ORDER A-021-0446 New On-Road Heavy-Duty Engines
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MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE <sup>1</sup>	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS <sup>2</sup>	ECS & SPECIAL FEATURES <sup>3</sup>
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ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)					
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<sup>3</sup> CNG/LNG=compressed/liqeuified natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;  
L/MH HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDO=heavy duty Otto;  
ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; WU (prefix) =warm-up catalyst; DPF=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAFS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SFI/MFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; ID/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR=exhaust gas recirculation; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; (2) (suffix)=in series  
(2006DEC22)

# Exhaust Emissions Standards (Diesel Fuel)

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.1 (urban bus) or 13 CCR 1956.8 (other than urban bus); 2) the EURO and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, in g/bhp-hr, for this engine family. "Diesel" CO, EURO and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.1 or 13 CCR 1956.8 are in parentheses.)<sup>4</sup>

	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.14	0.14	*	*	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	1.25	1.25	1.2	1.2	*	*	*	*	*	*
CERT	0.02	0.000	1.06	0.64	1.1	0.8	0.1	0.00	0.001	0.000	*	*
NTE	0.21		1.88		1.8		19.4		0.02		*	

<sup>4</sup> g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; EURO=Euro III European Steady-State Cycle; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde;

**BE IT FURTHER RESOLVED:** Certification to the FEL(s) listed above, as applicable, is subject to the following terms, limitations and conditions. The FEL(s) is the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

**BE IT FURTHER RESOLVED:** The listed engine models have been certified to the split engine family standards under 13 CCR 1956.8(b) [Diesel engines] or 13 CCR 1956.8(d) [Otto engines] and the incorporated 40CFR 86.007-15(m)(9).

**BE IT FURTHER RESOLVED:** For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels) and 13 CCR 2035 et seq. (emission control warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.



# Exhaust Emissions Standards (CNG Fuel)

	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	*	*	*	*	1.2	*	15.5	*	0.01	*	*	*
FEL	*	*	*	*	*	*	*	*	*	*	*	*
CERT	*	*	*	*	1.0	*	0.1	*	0.00	*	*	*
NTE	*		*		*		*		*		*	

\* g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; EURO=Euro III European Steady-State Cycle; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde.

# Average, Banking & Trading (ABT) Program

- Title 13, California Code of Regulations, section 1956.8
- 2007+ model year engines with certified above 0.01g PM standard
- Additional PM and NOx control needed?



# ABT Engines

Model Year	Make/Model	Service Class	Engine Family Name	Executive Order Number
2007	Cummins ISM	HHDD	7CEXH0551MAC	A-021-0452
2007	Ford E-Series	MDDE	7NVXH06.0AED	A-010-1456
2007	Ford E-Series	MDDE	7NVXH06.0AED	A-010-1456-1
2007	Ford 6.0 E-Series	MDDE	6NVXH06.0AED	A-010-1379
2007	General Motors 6.6	MDDE	7GMXH06.8590	A-006-1414
2007	General Motors 6.6	LHDD	7GMXH06.6590	A-006-1426
2007	International 6.0	LHDD	7NVXH06.0AEC	A-004-0314
2007	International 6.0	MDDE	7NVXH06.0AED	A-004-0315
2008	Cummins ISM	HHDD	8CEXH0661MAC	A-021-0466
2008	Cummins ISM	HHDD	8CEXH0661MAC	A-021-0466-1
2008	Ford 6.0 E-Series	MDDE	8NVXH06.0AED	A-010-1461
2008	International 6.0	MDDE	8NVXH06.0AED	A-004-0323

# Exhaust Emissions Standards (ABT Engine-Diesel Fuel)

in g/bhp-hr	NMHC		NO <sub>x</sub>		NMHC+NO <sub>x</sub>		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.5	0.5	*	*	*	*	15.5	15.5	*	*	*	*
FEL	*	*	*	*	2.5	2.5	*	*	0.10	0.10	*	*
CERT	0.1	0.1	*	*	2.4	2.3	1.0	0.4	0.10	0.06	*	*
NTE	0.6		*		3.1		19.4		0.12		*	

g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; EURO=Euro III European Steady-State Cycle, including RMCSET=ram mode cycle supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NO<sub>x</sub>=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde;

# Aftermarket Parts Exemption

- California's anti-tampering law
  - Prohibits modifying or tampering with an engine or exhaust system
- Exemption for use of non-OEM engine and exhaust system parts

**Aftermarket, Performance and**

**Add-on Parts info:**

**[www.arb.ca.gov/msprog/aftermkt/aftermkt.htm#ca](http://www.arb.ca.gov/msprog/aftermkt/aftermkt.htm#ca)**

# Verified Diesel Emission Control Systems

- DECS
  - Level 1, 2, & 3 PM Control
  - NOx Reduction
- Verified Emission Reduction
- Warranty
- Aftermarket Parts Exemption

**Currently Verified DECS:**

[www.arb.ca.gov/diesel/verde/vt/cvt.htm](http://www.arb.ca.gov/diesel/verde/vt/cvt.htm)



# **In-Use Fleet Regulations**

# In-Use Fleet Regulations

- Solid Waste Collection Vehicle
- Public Transit Agencies
  - UB and TFV requirements
- Public Agencies and Utilities
- In-Use Off Road Mobile Equipment
- Statewide Truck and Bus Regulation  
(in development)

# What is BACT?

- Retire
  - low-usage, scrap, sale/operated out-of-state
- Repower
  - Engine meeting 0.01g/bhp-hr PM, clean gasoline, alternative fuel
  - Existing Alternative Fuel OK (2004-2006 MY must meet 1.8g/bhp-hr NOx Optional Standard or less)
- Retrofit
  - Highest level Diesel Emission Control Strategy

# Statewide Truck & Bus Regulation



**Concrete Mixer**



**Dump Truck**



**Drill Rig**



**Water Truck**



**Hay Squeeze**



**Tow Truck**



**Reefer Van**



**Fuel Tank Truck**



**Passenger Bus**



# Statewide Truck & Bus Regulation Scope

- Diesel vehicles operating in California
  - Trucks, buses, yard trucks, other
  - Interstate, intrastate, international
- Shuttle Vehicles - Any GVWR which transports passengers for hire
- Vehicles greater than 14,000 GVWR
- Any person, business, or government agency who owns or sells a vehicle in California

# Excluded from Scope of Regulation

- Pickups and other vehicles with GVWR less than 14,000 lbs except shuttle buses
  - Regardless of towing capability or combined weight rating
- Emergency vehicles
- Tactical military vehicles
- Personal use motor homes



# Statewide Truck & Bus Regulation

- **Upgrade requirements phase-in 2010-2021**
  - 2007 model year engine emissions (2010-2013)
  - 2010 model year engine emissions (2017-2021)
- **Exhaust retrofits if equivalent emissions**
- **Compliance Approach**
  - Best available control technology schedule or
  - Fleet average
- **Certain special provisions**

# Upcoming Public Workshops

- To discuss revised proposed regulatory language, preliminary results from vehicle surveys, economic impacts, inventory, and additional outreach efforts
- Six Rounds of Workshops
  - Twenty-Four meetings since April 2006
- Next Workshops
  - Late May/Early June & July

## Statewide Truck and Bus Regulation

[www.arb.ca.gov/msprog/onrdiesel/workshops.htm](http://www.arb.ca.gov/msprog/onrdiesel/workshops.htm)

[www.arb.ca.gov/dieseltruck](http://www.arb.ca.gov/dieseltruck)

**Hotline #: 1-866-6Diesel**



# ARB Listserver Website

[www.arb.ca.gov/listserv/listserv.php](http://www.arb.ca.gov/listserv/listserv.php)

## Regulation

**Solid Waste Collection:**

**Public Transit Agencies:**

**Public Agencies and Utilities:**

**In-Use Off Road:**

**Statewide Truck & Bus:**

## Email List

swcv

bus-tfv

bus-ub

publicfleets

ordiesel

onrdiesel

# **Diesel Programs and Activities**

**[www.arb.ca.gov/diesel/diesel.htm](http://www.arb.ca.gov/diesel/diesel.htm)**

**Kathleen Mead**

**Manager, Retrofit Implementation Section**

**(916) 324-9550; [kmead@arb.ca.gov](mailto:kmead@arb.ca.gov)**

**Eric Bissinger, Urban Bus Requirements**

**(916) 324-9424; [ebissing@arb.ca.gov](mailto:ebissing@arb.ca.gov)**

**Adam Gerber, TFV Requirements**

**(916) 323-5445; [agerber@arb.ca.gov](mailto:agerber@arb.ca.gov)**

**Fleet Rule for Transit Agencies – [www.arb.ca.gov/msprog/bus/bus.htm](http://www.arb.ca.gov/msprog/bus/bus.htm)**

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**Tony Brasil, Manager**

**In-Use Control Measures Section**

**(916) 323-2927; [abrasil@arb.ca.gov](mailto:abrasil@arb.ca.gov)**

**Statewide Truck and Bus Regulation - [www.arb.ca.gov/dieseltruck](http://www.arb.ca.gov/dieseltruck)**

**Hotline # : 1-866-6Diesel**

# Questions ?

